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# The Structure and Activities of Inter-organizational Knowledge Sharing

## Chain and Network

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**Abstract:** The present article aims to provide a theoretical foundation for the evaluation and categorization of the knowledge domain of Chain and Network Science (CNS). It aims to clarify what the field of CNS includes and to investigate where we stand in developing CNS. It elaborates on a number of important theories that provide insight in the structure and activities of actors in chains and networks, and discusses the key issues that are raised by each theory. It concludes by suggesting some important research questions in the field of CNS, integrating the different theoretical perspectives, and touching upon a number of management challenges for the years to come.

**Keywords:** chains, Networks, Inter-organizational

### 1. INTRODUCTION

In the traditional sense, Food and agriculture business companies are facing ever-faster changes in the business environment. Food supply chain management (SCM), once characterized by autonomy and independence of actors, are now rapidly moving towards internationally interconnected systems with a large variety of complex relationships. This is changing the way food is brought to the market. Currently, even fresh produce can be shipped from halfway around the world in competitive prices. However, at the same time, the transnational diseases and pollution can be also spread in a equal speed or even faster. In this situation, the collaboration between companies are essential. To achieve this goal, strategic and cultural alignment, trust and compliance to national and international regulations and customs are always the key managerial issues.

What's more, the growing concern of consumers regarding the quality, traceability, impact on health and environmental friendliness of products and processes ask for new ways of developing, producing, monitoring, marketing, and even recycling of these products. So, new ways of organizing the food supply chain are needed. Not all food- and agribusiness company is able to meet all these demand at the same time. Consequently, food- and agribusiness companies should focus on few, unique, hard to imitate and distinctive core competencies, while establishing co-operations with other organizations in fields in which they do not posses distinctive competencies. For instance, some literature <sup>[1]</sup> argued that over 50% of Du Pont's new agricultural product leads stems from university laboratories. The capability of building and maintaining inter-organizational relationships are increasingly viewed as a most important factor to maintain competitive advantage. As <sup>[2]</sup> concludes: 'To be part of a network, and to be able to effectively exploit the information that circulates in the network, has become even more valuable than being able to generate new knowledge autonomously.' In cite: 'Today the watchword is not dividing and conquer but co-operate-to-compete' <sup>[3]</sup>. In this new competitive business environment, the ultimate success of the company will depend on the manager's ability to integrate the company's intricate network of business relationships with outside companies. Therefore, better understanding of the principles underlying actor-networking and network governance is to be considered as a mission of paramount significance for multidisciplinary research.

The present paper intends to provide a knowledge map, a tool for directing and focusing chain and network research. It aims at clarifying what the field of Chain and Network Science (CNS) includes, investigating where we stand in developing CNS and to present an agenda of research themes and management challenges for the years to come.

## 2. THEORETICAL FOUNDATION

CNS is the theoretical domain related to the analysis of chains and networks <sup>[4]</sup>. It concentrates at the behavioral and social aspects of organization and governance of exchange relationships, the nature of choices being made, the incentives and constraints, the basis and the use of power, and the nature of interaction and communication. CNS develops on the basis of theory inspired research work drawn from academic knowledge developed within various disciplines, such as business administration, sociology and economics, combined with empirical evidence of chain and network engineering. Following <sup>[5]</sup>, we define the object of study of CNS as the ensemble of actors that, through a pattern of related activities, produce and transfer value objects. These activity patterns may be referred to as the chain and network processes, the value objects that flow through the network as the network flows, and the pattern of inter-actor relations as the network structure. This includes their modes of competition and co-operation, and the mechanisms implemented for governance and management of these processes.

We will elaborate on a number of theories that provide insight in the structure and activities of actors in chains and networks, and we will discuss the key issues and research questions that are raised by each theory below. The reader should keep in mind, though, that the overview provided is not exhaustive, it merely gives an impression of the richness of approaches to inter-organizational co-operation.

### 2.1 network theory

In CNS, networks are looked upon as the total of actors within one industry and/or between related industries, which can potentially work together to add value to customers. Actors can be distinguished, either at the micro-level, where the actor is a person, for instance the individual producer, an entrepreneur etc., or at meso-level, where actors are aggregations of individuals working together for a common goal, e.g. firms, research institutes, and government agencies. Important is the reciprocal character of the relationships between the actors. As Powell in states: ‘The basic assumption of network relationships is that one party is dependent on the resources controlled by another, and that there are gains to be had by the pooling of resources’ <sup>[6]</sup>.

One of the main contributions of the Industrial Marketing and Purchasing Group (IMP) on network research is the actor, resource, and activity model <sup>[7, 8]</sup>. In this approach, the necessity for organizations to exchange resources is an important explaining factor for inter-organizational relationships. Activities of actors occur in the form of chains of activities (R&D, marketing and sales, administration etc. combined to value chains, such as <sup>[9]</sup>). Recently, social capital theory has become an important new branch within the network approach. The social capital argument assumes that forms of collaboration are not only based on economic motivations. Actors are believed to act on the basis of their functional role in the network, while goal orientation, interests, rules and power relations are determining this role in literature <sup>[10]</sup>. The actors in these networks will search for alliances, some of them based on trust and loyalty, while others will be based on opportunism. A key factor is the process that takes place over time in which actors are able to adjust transactions, accommodate routines, transfer activities to other actors and build up common recipes, standards and cognitive maps. In the course of this process the network becomes either sustainable, or stagnates and even collapses. In other words, the behavior and expectations of actors are constrained by the degree to which the relationship between the actors is embedded in the network structure. Network-relations may enhance the ‘social capital’ of a company, by making it feasible to get easier access to information, technical know-how and financial support.

But, at the same time, these relationships may lead to ‘social liability’, e.g. by reducing the possibilities to relate to companies outside the network, risk of spill-over, and high co-ordination costs of the network-relations. Some literature also provides an extensive overview of the social capital research to date.

To make the transition to the key research questions and managerial challenges that are supported by network theory we use the framework of Moller and Halinen’s article <sup>[11]</sup> that identifies four levels of network management: network visioning, network analysis, portfolio management and relationship management. Below we will discuss the relevant research questions and management issues for each level of network management.

*Level 1:* Network visioning: Understanding the structure, processes and evolution of the different networks within one industry or between industries is essential for network management. Therefore, key managerial issues at this level are: How to develop a valid overview over the relevant networks within one industry or between industries, and how to identify strategic opportunities within these networks.

*Level 2:* Network management: Firms’ strategic behavior can be analyzed through the networks they belong to and through the positions and roles they play in these networks. The capability to identify, evaluate, construct and maintain positions and relationships in a network environment is therefore essential. Key managerial issues at this level are: “How to develop and manage strategic networks (supplier networks, development networks or customer networks)?” How to enter new networks (for new market entry, or developing new products and services), and manage the network positions.

*Level 3:* Portfolio management: A firm can be looked upon as a nexus of resources and business activities. A capability to manage a portfolio of exchange relationships in an integrated manner is therefore required. Key questions at this level are: Which of these activities should be carried out internally and which through different types of exchange relationships, and how to develop and manage a customer or supplier portfolio.

*Level 4:* Relationship management: A capability of creating, managing and concluding individual customer and supplier relationships is required. Key issues at this level are: How to evaluate the lifetime value of customer and supplier relationships, and how to manage the relational episode efficiently.

## 2.2CNS and supply chain management

Within the realm of CNS, supply chains are considered to be composed of the actors in a business network which vertically work together to add value to customers. Supply chain management (SCM) focuses on value creation and the product flow through the chain from primary producer up to the consumer. Key attention is paid to integration or attuning of operational processes, such as logistics and quality management, and supporting processes, such as ICT and transportation. ICT, especially, is of major importance in SCM, enabling companies to shift activities to third party providers and allowing firms to co-operate across markets and across industries. Following Vander Vorst’s research we define SCM as follows: ‘Supply Chain Management is the integrated planning, co-ordination and control of all logistical business processes and activities in the SC to deliver superior consumer value ....’ <sup>[12]</sup>.

SCM clearly has an applied research perspective, what translates into a strong focus on the design and redesign of supply chains and supply chain systems, such as supply chain information sharing and monitoring systems, systems for inventory reduction, joint planning systems, logistics systems, supply chain costing, benefits sharing systems, and performance systems.

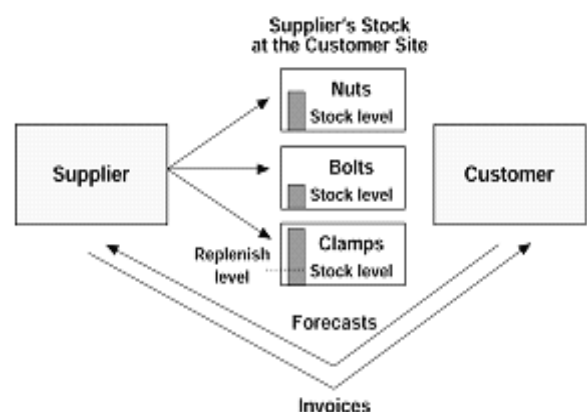


Figure 1. The SCM view of a company in the center of network

Figure 1 shows that SCM views a company in the centre of a network of suppliers and customers. Major characteristics of a supply chain are that it evolves through several stages of increasing intra- and inter-organizational integration and co-ordination, and spans from the initial source (supplier's supplier, etc.) to the ultimate consumer (customer's customer, etc.). It seeks to fulfill the goals of providing high customer value with an appropriate use of resources, and building competitive chain advantages. Supply networks may differ in shape, reflected in the breadth and length of the network. Where the breadth of the network reflects the number of suppliers and customers, the length of the network reflects the number of echelons to the end-user. In recent years, the breadth of many supply networks is narrowed, because of the general transition to a limited number of 'preferred suppliers'.

Some literature also relates the difference between supply chain analysis (SCA) and network analysis (NA) to differences in interdependencies between firms or agents. They differentiate between sequential interdependencies, which refer to sequentially structured tasks, and pooled interdependencies, which refer to situations where each actor makes a discrete independent contribution to a given task, or reciprocal interdependencies where such contributions are mutually dependent. They posit that where SCA focuses on sequential interdependencies, NA deals primarily with either pooled or reciprocal interdependencies. By relating the differences between SCA and NA to the nature of interdependencies between organizations, they construct a formal basis for integrating them in a 'NetChain approach'. In this approach, the combination of actors and rules results in a certain type of 'NetChain architecture'. Optimizing this architecture and the intensity of co-operation may generate added value. They define a NetChain as: 'a set of networks comprised of horizontal ties between firms within a particular industry or group, such that these networks (or layers) are sequentially arranged based on the vertical ties between firms in different layers.'

According to the previous study, business managers are increasingly aware of the emerging paradigm of inter-network competition. Executives are striving to interpret the company's chain and network structure. To assist them, there is a clear need for building theory and developing tools and methods for successful CNS practice. Below an overview is given of relevant research issues:

- The operational definitions of the key business processes and what are the relationships among these processes.
- The obtain buy-in from the functional areas in order to implement a process approach within the firm. Beyond internal integration, how inter-organizational change management should be implemented.
- The processes should be used to map the best chain structure given the desired outputs.
- The methods that should be used to determine the value proposition at the consumer level. How should the various firms in chains share the costs and the benefits.
- The metrics should be used to evaluate the performance of chains and networks.
- The critical success factors and barriers to link a firm to specific companies in chains.
- The firm decide which internal processes to link with these companies. The decision criteria determine whose internal business processes prevail across all or part of chains.
- The type and level of integration that should be applied to each process-link.

### **2.3 industrial organization theory**

Industrial organization theories, such as transaction cost economics (TCE), agency and game theory are concerned with the governance relationships of organizational co-operation, integrating views from business economics and organizational theory. TCE and agency theory provide the rationale for the make-or-buy decisions that determine which chain activities will be vertically integrated and which will be produced through transactions with other firms. In TCE transactions are characterized by their frequency, uncertainty, and asset specificity. TCE offers interesting starting points for the analyses and design of vertical

governance relationships, although there is still limited empirical evidence of the performance effects of following ‘TCE guidelines’. One of the reasons for this might be that neither buyers nor suppliers are completely free to select and change counterparts. The degree of dependency of an actor on its counterparts is contingent

upon the criticality of the resources supplied (the asset specificity), so power balances play an important role, and game theory can be helpful to describe the individual actor’s dilemma. Agency theory is directed at the ubiquitous agency relationship, in which one party (the principal) delegates work to another (the agent), that performs the work. It focuses on risk assessment and contractual arrangements under conditions of bounded rationality and opportunism. A major point of attention is the trade-off between the cost of measuring behaviour and the cost of measuring outcome and transferring risk to the agent. Therefore, agency theory can help to analyses decisions concerning the type of agreement (contract) governing transactions and the type of control system chosen.

Exchange relationships within chains and networks imply certain features, e.g. a certain degree of flexibility, durability, information exchange, and trust, which are delivered against a certain price (the transaction costs or management costs). Key questions in the realm of governing these exchange relationships are:

- The stability and durability of an exchange relationship, the knowledge exchange in such a relationship, and the level of trust that is being developed.
- Exchange relationships are challenged by turbulence in the external socio-economic environment and by internal disputes and conflicts of interests among agents. Which exchange relationships are able to deal with these tensions and survive and which tend to disintegrate.
- The role of investments in relation-specific assets and co-specialization, or in competencies that are non-transferable and unique to the chain or network.
- The relationship between the organizational features of specific chain or networks and the organizational features of the actors involved.
- The chain or network implies a distribution of authority and responsibilities that transgress traditional organizational boundaries, how does this affect the internal organization and functioning of the individual firm.
- The development of the institutions that govern the transactions between actors in a chain or network an autonomous process and to what extent can it be guided and directed.

### 3. CONCLUSIONS

In our view, chain and network research should focus on the construction of a toolbox, comprising theories which balance the approaches discussed in this paper, analyzing the dynamics of co-operative arrangements, combined with methods and techniques, and working applications to analyze and improve the management of supply chains and networks. More specifically, integrated chain and network research should focus on:

- 1) Present institutional arrangements, including the ownership and distribution of assets (both production facilities and intangibles like knowledge and goodwill), possibility that arrangements to lead to lock-in.
- 2) Institutional and policy change in the aggregate level, and differences in institutional arrangements among industries and across countries.
- 3) Degrees of interdependence between actors (power relationships): the way typical characteristics of dependence of one actor upon another influences the evolution of institutional arrangements on the micro-level (the firm), the memo-level (the network), or the macro-level (the socio-economic environment).
- 4) Collaborative arrangements be provided with characteristics of technology are available make for

manage interaction (the transaction technologies), for instance, the impact of ICT.

We will suggest some interesting research questions in the field of CNS, integrating the different theoretical perspectives, and touching upon a number of important management issues, below. For example, which are the critical success factors for the design and control of chains and networks. which governance structures should be used if companies decide to join forces to enhance the innovative potential of their chains and networks, what organizational conditions and institutional arrangements stimulate dynamism and innovation and can technological opportunities be effectively exploited; how should these firms share the costs and benefits of their co-operation. what metrics should be used to evaluate the performance of chains and networks. how to design and operate information architectures for adequate information provision throughout the chains and networks. how to build systems to monitor processes and flows of goods throughout supply chains and networks regarding value-related aspects (e.g. environmental issues, animal welfare, and the logistics aspects of the production and distribution of GMO-free products), include how should inter-organizational management be implemented in international chains and networks, how should developing countries be integrated into international food- and agribusiness chains and networks, knowledge and technology transfer issues ,and etc.

In conclusion, the description of the knowledge domain of CNS is a starting point, a first attempt to define and delineate this new multidisciplinary field of research, a first step in structuring current thought on chains and networks and in identifying future development paths. We strongly feel that although considerable progress has been made over the past couple of years in the development of CNS, clearly a number of important and exiting challenges are still waiting to be tackled.

## REFERENCES

- [1] Cooper, M.C., D.M. Lambert, and J.D. Pagh .(1997). Supply Chain Management: More Than a New Name for Logistics, *International Journal of Logistics Management*, Vol. 8, No. 1, pp 1-14.
- [2] Diederer, P.J.M. and H.L. Jonkers.( 2001), KLICT Working Papers, [www.KLICT.org](http://www.KLICT.org)
- [3] Freeman, C, (1990), *The Economics of Innovation*, Edward Elgar, Aldershot
- [4] Eisenhardt, K. M. (1989), Agency Theory: An Assessment and Review, *Academy of Management Review*, Vol. 14, No. 1, pp. 57-74.
- [5] Ellram, L.M. and M.C. Cooper. (1993), The Relationship between Supply Chain Management and Keiretsu, *International Journal of Logistics management*, Vol. 4, No.1, pp.1-12.
- [6] Ford, D. and M. Saren .(2001), *Managing and Marketing Technology*, Thomson Learning, London
- [7] Gambardella, A. (1992), Competitive Advantages from In-house Scientific Research. The US Pharmaceutical Industry in the 1980s, *Research Policy*, Vol. 21, pp. 391-407
- [8] Håkansson, H. (1992), Evolution Processes in Industrial networks, in *Industrial Networks*, Routledge, London, pp.129-143
- [9] Håkansson, H. (1982), *International Marketing and Purchasing of Industrial Goods*, John Wiley & Sons, Chichester
- [10] Uzzi, B. (1997), Social Structure and Competition in Interfirm Networks: the Paradox of Embeddedness, *Administrative Science Quarterly*, Vol. 42, pp 35-67
- [11] Moller K.K. and A. Halinen.(1999), Business Relationships and Networks: Managerial Challenge of Network Era, *Industrial Marketing Management*, vol. 28, pp. 413-427.
- [12] Jack G., Vander D V.(2006), Effective partnerships for agri-food chains: the impact of supply-chain partnerships on supplier